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A LIST OF PHYTOPHAGOUS CHALCIDOIDEA WITH DESCRIPTIONS OF TWO NEW SPECIES.[1]

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Phytophagous habits among certain groups of Chalcidoidea although strenuously disputed at one time are now established and well known facts. C. R. Crosby in 1909 (Cornell Univ. Agr. Exp. Sta. Bull. 265, p. 368) gave a short resumé of the groups and species at that time known to be plant-feeders. Included in this list are representatives of three families, viz., Agaonidae, Callimomidae (=Torymidae), and Eurytomidae. Excepting the Agaonidae or true fig insects, and the Callimomid subfamily Idarninae associated with the fig-insects but whose relationship is not clearly understood, all of the phytophagic forms listed by Crosby, with one exception, are either seed chalcids or grass and grain stem-infesting species. The single exception is the Eurytomid, (*Isosoma*) *Eurytoma orchidearum* Westwood, which infests the leaves and stems of orchids.

Crosby apparently overlooked two or three interesting papers, and more recent literature has brought to light numerous additional examples of phytophagic species. These additional records not only involve other groups of Chalcidoidea, but show an interesting diversity in modes of life.

Whereas Crosby's list showed representatives of only three families, the present list includes species placed in six families. The three not included by Crosby are *Perilampidae*, *Encyrtidae*, and *Eulophidae*. There is considerable doubt in the writer's mind whether all of the species are correctly placed but the fact remains that they probably represent groups quite different from those commonly known to include plant-feeding species. In Ashmead's systematic arrangement of the families, the *Agaonidae* are placed first and the *Eulophidae* last with the four other families, in which phytophagy is said to occur, ranging themselves between. This fact, provided they are correctly classified, would seem to indicate that plant-feeding

[1]This paper is a contribution from the Division of Cereal and Forage Crop Insects, Bureau of Entomology, U. S. Department of Agriculture. Credit for the included list of phytophagous species is largely due to Miss Margaret Fagan who has compiled from literature most of the references and data.

species may be looked for in other families and that ultimately phytophagy may prove to be much more common than at present suspected.

Seed-chalcids and joint-worm flies are by no means the only phytophagic forms. Certain species are definitely stated to be makers of galls, the galls in some instances at least showing a marked resemblance to Cynipid galls. Other species are said to bore in plant tissue much as do certain Coleoptera, Diptera, and Lepidoptera.

The list of food plants is a varied one. Species are shown to infest seeds of such widely different groups of plants as Leguminaceae, Lauraceae, Pomaceae, Rosaceae, Myrtaceae, Vitaceae, Mimosaceae, and Anacardiaceae, as well as the various groups of conifers. The so-called joint worms are found attacking a long list of grains and grasses and a new species described herewith infests the young stems of bamboo. The gall-makers are found on *Acacia*, *Eucalyptus*, *Asparagus*, *Scutia*, and on other unnamed plants. Of the species which may be classed as borers, one infests orchids, another lives in the fleshy part of juniper berries, while still another is said to bore under the bark of *Eucalyptus*.

Thus it will be seen that both in manner of living and in the matter of food plants the phytophagous Chalcidoidea exhibit no small degree of adaptability. So far as known none of the species feed as exposed larvae, all being internal feeders in the larval state. Doubtless this will prove to be an invariable rule since the structure of the larva would need to be greatly modified from the usual type in order to enable it to exist as an external feeder. With this single limitation there seems to be no good reason why they should be confined in their activity to the few modes of living which have been enumerated. It would appear entirely within the range of probability that species may yet be found duplicating in their modes of living many of the other internally feeding insects of other orders. For example, many species of Chalcidoidea are parasitic upon leaf-mining hosts, and, in the light of what has already been shown, it would not be surprising eventually to discover a Chalcidoid which is itself a genuine leaf-miner.

It may be noted here that not only are the phytophagous forms distributed through a number of families but in many cases they apparently do not offer even minor group characters which will permit them to be differentiated even generically from species known to be parasitic. Thus we find phytophagous species of the genus *Eurytoma* which can be separated specifically only with great difficulty from forms known to be parasitic upon Lepidoptera, Diptera, and Coleoptera. The genera *Syntomaspis*, *Callimome*, *Megastigmus*, and *Tetrastichus* each contains both

parasitic and phytophagous forms, if published records are to be credited.

Attention should also be called to the fact that the phytophagous species, so far as known, belong almost exclusively to groups in which a large percentage of the related parasitic forms breed in host larvae which are concealed within plant tissue. Parasitic Eurytomidae and Callimomidae are largely found infesting gall-makers, borers in wood or herbaceous plants or insects which infest fruits or seed capsules. Rarely if ever is a species of either of these groups parasitic upon a free living or exposed larva. The phytophagous Eulophidae likewise apparently belong to groups in which many of the species are parasitic upon gall-makers and leaf-miners although the hosts are not so restricted as in the previously mentioned groups. The single phytophagous genus and species of Encyrtidae placed by its describer in the subfamily Eupelminae, tribe Tanaostigmini, is unknown to the writer except through the description and figure. The tribe is an anomalous one and its relation to the Eupelminae is open to serious doubt. The known species are not numerous. The type genus and species were described by Howard (Ins. Life, vol. 3, 1890, p. 147) from specimens cut from abnormally swollen ovaries of a leguminous tree (*Coursetia? mexicana*), and the author was uncertain whether the species was phytophagous or parasitic, although he states that no indications of parasitism were found. Other species of the tribe are said to be parasitic upon various species of Coleoptera, which cause gall-like malformations of the seed heads of *Prosopis*, *Hibiscus*, *Helianthus*, and other plants. The phytophagous species of Perilampidae, if rightly placed, would form an exception to this rule since true Perilampids are usually associated, either as primary or secondary parasites, with free living host larvae. The writer is strongly inclined to doubt the relationship of these gall-making forms to true Perilampids. They appear to be more closely related to the Decatomini, and it is not improbable that all of these so-called Perilampids really belong to the Eurytomidae(?) and that they should constitute a separate subfamily made up of many genera now placed in the Perilampidae, as well as several from the Pteromalid tribe Isoplatini. The writer is not willing to commit himself definitely on this point without further study.

Consideration of the foregoing facts very naturally starts a train of speculation as to the evolution of the phytophagous habit in Chalcidoidea. Were the Chalcidoids originally parasitic as a group with phytophagy a more recently acquired habit? Were they as a group originally vegetable feeders and is the present parasitic habit of the vast majority of the species a later development, the phytophagous habit being retained by only a comparatively few forms. Or were they originally

plant-feeders, later turning to parasitism and then again to phytophagy, perhaps in a different form?

There can be no doubt that the progenitors of the Chalcidoidea at perhaps the earliest period in their developmental history were plant feeders. Whether the morphological break away from the ancestral type of structure which resulted in the development of the modern Chalcidoidea took place before the beginning of the parasitic habit, coincidental with it, or whether parasitism developed after the break is an interesting problem but is beside the point. Unless one is willing to believe that they arose from a source entirely separate from that of other insects and at a later date, it is impossible to conceive of the Chalcidoids and their ancestors always having been parasitic. The possibility of such an origin will, I think, be rejected without serious consideration and the first stated hypothesis may, therefore, be discarded.

It is evident, then, that at some point in their evolution the Chalcidoidea themselves or their ancestors were phytophagous and that parasitism must have been a subsequent development. The second and third hypotheses may be restated as one in the following manner: Did a part of the original Chalcidoid stock become adapted to a parasitic life while another part retained its original plant-feeding habits, and could these two habit-groups (if I may so designate them) maintaining such entirely different modes of existence have come down to us through the ages without any radical divergence in structure which would enable us at the present day to separate them into different genera and only with great difficulty into different species?

I believe not. The very numerous and highly specialized forms to be found among the Chalcidoids seem to indicate a high degree of plasticity and it would appear extremely unlikely that two such different modes of existence could be maintained throughout long geological periods without resulting in the development of marked structural differences to correspond. One would naturally expect structural differentiation between two such habit-groups if long continued and it would be much easier to believe that phytophagy as found to-day is a continuation from ancestral type if it were at present confined to a restricted group or to nearly related groups. Such is apparently not the case, however, as we find it showing up more or less sporadically throughout the superfamily and in such widely separated groups, as regard specialization of structure, as Eurytomidae and Eulophidae. Acceptance of the idea that phytophagy on the one hand and parasitism on the other could exist for any great length of time without differentiation of structure would, it seems, in an inverse manner, entail rejection of the fundamental principle that environment is one of the controlling factors in structural modification. Verification of

this point is apparently to be found in the Cynipoidea, another group containing both parasitic and phytophagous forms. While it is probably not possible to point to any one structural character or group of characters which will separate the parasitic Cynipoids as a whole from the gall-making forms, it is nevertheless true that certain more or less definite structural groups are always parasitic while others are always phytophagous and one is able to determine with considerable confidence from examination of any given specimen whether it is parasitic or phytophagous. This does not warrant the assumption that phytophagy even among the Cynipoids is a continuation from ancestral type but certainly does seem to indicate that it has longer existed in this group than in the Chalcidoids.

Parasitic forms of the Chalcidoids have been shown to possess to an extremely high degree the ability to adapt themselves to different environmental conditions. Not only do they attack successfully all manner of insect hosts under almost every conceivable condition as regards environment, but they attack them in the egg, larval, and pupal stages, and they may be either primary parasites or hyperparasites. Some individual species are not confined to a single host or to closely related hosts but live at the expense of widely different hosts, in some cases embracing even different orders. Several instances are known of species that develop either as primary or secondary parasites as circumstances determine. Considering these facts it seems certain that if phytophagy had long existed it would be found much more common than at present seems to be the case since there appears to be no good reason why the phytophagous forms should be more restricted in their powers of adaptation than the parasitic forms.

The most important point confirmatory of the probable recent development of phytophagy among Chalcidoids is found in the assertion by three different authors that certain species of Eurytomidae are parasitic in their early stages and finish their development as plant-feeders. Nielsen has claimed this to be the habit of an unnamed species of *Eurytoma*; Rimsky-Korsakov has recorded the same habit for *Harmolita inquilinum;* and Phillips asserts that *Eurytoma pater* follows the same mode of development. There is evidence that this phenomenon may occur in the development of other Chalcidoid species, notably with some of the gall infesting species which have been supposed to be commensals. Such a mode of development if proven to be at all common would seem to leave little room for doubt that phytophagy is a recent specialization.

On first thought the transition from a parasitic to a phytophagic existence would appear to involve an extremely radical ecological readjustment. One must, however, bear in mind that these now phytophagous species were, as shown by their

parasitic relatives, probably originally parasitic upon some internally feeding larva, frequently one living within a gall, or possibly a seed or a grass stem. More than likely in every instance the host larva lived in some such circumscribed position where not only its movements were restricted but its food confined to a particular kind of plant tissue. The parasite larva attacking such a host externally would be in direct contact with the plant food of its host. Feeding as it would upon a larva whose food was restricted to a particular kind of plant tissue, the food of the parasite would consist of the same material after it had undergone digestion and assimilation by the host. Just how great would be the chemical changes involved in these processes is of course unknown. In the case of an insect larva they would probably be relatively simple as compared to those of higher animals. The nutritive requirements of the parasite doubtless approximate chemically those of the host especially if the two be closely related as host and parasite sometimes are. Be this as it may, the fact is established that some insects are capable of accomodating themselves to a degree to either animal or vegetable food. Examples of this are found among Meloïd beetles which live parasitically in bees' nests, their young larvae first destroying the bee egg and then feeding upon the vegetable contents of the cell. Cannibalism is by no means an uncommon occurrence among certain plant feeding Lepidoptera. Among Hymenoptera, the Ichneumonid, *Grotea anguina* Cresson has been shown to live parasitically in bees' nests destroying first the egg or young larva of the bee and then feeding upon the bee bread. (Graenicher, Ent. News, vol. 16, 1905, p. 44.) That certain species of Chalcidoidea can and do develop partly as parasite and partly as plant feeders has just been shown.

Partial phytophagy probably was first forced upon the parasite by premature exhaustion of the natural food supply due to attacking a host which was insufficient in itself to furnish food for complete development. The transition from such a habit to that of development entirely as a plant feeder does not appear as such a difficult matter after all.

SPECIES CATALOG OF PHYTOPHAGOUS CHALCIDOIDS OTHER THAN THE FIG INSECTS.

Following is a list, compiled from literature, of the species of Chalcidoidea said to be phytophagous, omitting only the fig insects, *Agaonidae* and *Idarinae*. Only those species are included which have been expressly stated to be plant-feeders or probably plant-feeders. Records such as "reared from galls" or "reared from stems" have been disregarded unless the author has definitely indicated that the species was probably

phytophagous. In most cases only the most comprehensive account of the insect has been cited, no attempt having been made to catalog all of the references to the individual species. The host plant is given as found in the reference cited. For corrected botanical names see appended list of host plants.

Family AGAONIDAE.

AGAON, BLASTOPHAGA, AND RELATED GENERA. The fig-insects or caprifiers of the figs (*Ficus*). The entire family is supposed to be phytophagous, living in the seeds of figs.

Family CALLIMOMIDAE.

CALLIMOME TSUGAE Yano and Koyama, Rept. For. Bur. Tokyo, 1918, p. 38–58. (Rev. Appl. Ent., ser. A, vol. 6, 1918, p. 403.) Said to infest seeds of *Tsuga sieboldi* in Japan.

IDARNINAE.—This whole subfamily is found associated with the true fig-insects. Very little is known of their actual habits. Some are said to be inquilines while others are believed to be true parasites of *Agaonidae*.

MEGASTIGMUS ACULEATUS (Swederus): Wachtl, Wien. Ent. Zeit., 3, 1884, p. 38–39. Said to be phytophagous in seeds of rose in Europe. Also recorded from seeds of rose in North America by Crosby (Ann. Ent. Soc. Amer., vol. 6, 1913, p. 165); and in Japan, by Weiss (Journ. Econ. Ent., vol. 10, 1917, p. 448).

MEGASTIGMUS ALBIFRONS Walker: Crosby, Ann. Ent. Soc. Amer., vol. 6, 1913, p. 167–8. Reared from seeds of *Pinus ponderosa* from Placerville, California.

MEGASTIGMUS AMELANCHIERIS Cushman, Proc. Ent. Soc. Wash., vol. 19, (1917) 1918, p. 81. Reared from seeds of *Amelanchior canadensis* from Pickens, West Virginia, French Creek, West Virginia, and North East, Pennsylvania.

MEGASTIGMUS BALLESTRERII (Rondani): Stefani, Boll. Studi. Inform. R. Giardina Col. Palermo, 4, 1917, p. 101–131. Reared from fruits of *Pistacio vera* and *P. terebinthus* from Sicily. Probably occurs also throughout southern Europe, North Africa, and Asia Minor.

MEGASTIGMUS BORRIESI Crosby, Ann. Ent. Soc. Amer., vol. 6, 1913, p. 169. Reared from seeds of *Abies mariesi* in Japan.

MEGASTIGMUS BREVICAUDIS Ratzeburg: Rodzianko, Comment. Torym., 1908, p. 608–11. Reared from seeds of *Sorbus aucuparia* at Poltava, Russia. Recorded also by Crosby (Bul. 265 Cornell Agr. Exp. Sta., 1909, p. 375) from *Sorbus* seeds in New York.

MEGASTIGMUS CRYPTOMERIAE Yano, Rept. For. Bur. Tokyo, 1918, p. 35–58. Reared from seeds of *Cryptomeria japonica*, and *Chamaecyparis obtusa* in Japan.

MEGASTIGMUS INAMURAE Yano, Rept. For. Bur. Tokyo, 1918, p. 35–58. Reared from seeds of *Larix leptolepis* in Japan.

MEGASTIGMUS LARICIS Marcovitch, Can. Ent., vol. 46, 1914, p. 435. Reared from seeds of *Larix laricina* du Roi at Ithaca, N. Y. Larva completely devours the kernel.

MEGASTIGMUS LASIOCARPAE Crosby, Ann. Ent. Soc. Amer., vol. 6, 1913, p. 163. Reared from seeds of *Abies lasiocarpa*, from Rye, Colorado.

MEGASTIGMUS NIGROVARIEGATUS Ashmead: Crosby, Ann. Ent. Soc. Amer., vol. 6, 1913, p. 158–60. Reared from seeds of *Rosa rugosa* and other roses. Northern United States from Atlantic to Pacific.

MEGASTIGMUS PHYSOCARPI Crosby, Ann. Ent. Soc. Amer., vol. 6, 1913, p. 158. Reared from *Physocarpus pulifolius* (probably from the seeds), at Allentown, Missouri.

MEGASTIGMUS PICEAE Rohwer, Can. Ent., vol. 47, 1915, p. 97. Reared from seeds of *Picea sitchensis* in California. Records of the Bureau of Entomology show this species to have been reared from seeds of *Picea engelmanni* and *Picea parryana* also.

MEGASTIGMUS PICTUS (Förster): Wachtl, Wien. Ent. Zeit., 3, 1884, p. 214. From seeds of rose in Germany.

MEGASTIGMUS PINUS Parfitt: Crosby, Ann. Ent. Soc. Amer., vol. 6, 1913, p. 160. Infests seeds of *Abies nobilis*, *A. magnifica*, *A. concolor*, *A. amabilis*, *A. grandis*, and *Tsuga* sp. Western United States.

MEGASTIGMUS PISTACIAE Walker: Wachtl, Wien. Ent. Zeit., 12, 1893, p. 28. Lives in fruits of *Pistacio lentiscus* Linné. Probably phytophagous. France and Italy.

MEGASTIGMUS SPERMOTROPHUS Wachtl: Crosby, Ann. Ent. Soc. Amer., vol. 6, 1913, p. 163. Infests seeds of *Pseudotsuga taxifolia*, *Abies magnifica*, *A. amabilis*, *A. grandis*, *A. concolor*. Recorded in the Bureau of Entomology from seeds of *Abies shastensis* also. Occurs in Europe and western part of North America.

MEGASTIGMUS STROBILOBIUS Ratzeburg: Judeich and Nitsche, Lehrbuch der Forstins., 1893, p. 704, 1339. From seeds of *Abies pectinata*. Germany.

MEGASTIGMUS THUYOPSIS Yano, Rept. For. Bur. Tokyo, 1918, p. 35–58. In seeds of *Thuyopsis dolabrata* in Japan.

MEGASTIGMUS TSUGAE Crosby, Ann. Ent. Soc. Amer., vol. 6, 1913, p. 162. Reared from seeds of *Tsuga Mertensia hookeriana* in the western United States.

SYNTOMASPIS AMELANCHIERIS Cushman, Proc. Ent. Soc. Wash., vol. 19 (1917) 1918, p. 82–3. Reared from seeds of *Amelanchier canadensis* collected at Pickens, West Virginia, and North East, Pennsylvania. Doubtfully phytophagous. At least, sometimes parasitic on *Megastigmus*.

SYNTOMASPIS AUCUPARIAE Rodzianko, Bull. Soc. Nat. Moscou, (1907), 1908, p. 592–601. Reared from seeds of *Sorbus aucuparia* in Russia.

SYNTOMASPIS DRUPARUM (Boheman): Mokrzecki, Zeitschr. wiss. Insektb 2, 1906, p. 390–92; Crosby, Bul. 265 Cornell Agr. Exp. Sta., 1909, p. 369; Cushman, Journ. Agr. Res., vol. 7, 1916, p. 487. Infests seeds of apple (*Pyrus*) and of Mountain ash (*Sorbus*) in Europe and North America.

SYNTOMASPIS MYRTACEARUM da Costa Lima, Arch. Mus. Nac. Rio Janeiro T. 19, 1916, p. 199. Phytophagous in seeds of *Psidium guayava* (Guava) in Brazil.

Family EURYTOMIDAE.

BEPHRATA CUBENSIS Ashmead: Crawford, Proc. U. S. Nat. Mus., vol. 41, 1911, p. 274. Infesting seeds of *Anona* in Cuba.

BEPHRATA PARAGUAYENSIS Crawford, Proc. U. S. Nat. Mus., vol. 41, 1911, p. 274. Reared from seeds of *Anona* sp. received from Paraguay.

BRUCHOPHAGUS FUNEBRIS (Howard): Webster, Bur. Ent. Circ. 69, 1906. Infests seeds of clover (*Trifolium*) spp. and alfalfa (*Medicago sativa* Linné.). Probably cosmopolitan.

BRUCHOPHAGUS MELLIPES Gahan,[1] Proc. U. S. Nat. Mus., vol. 56, 1919, p. 513; *Eurytoma indi* (Girault) Ramakrishna Ayyar, Rept. Proc. 3d Ent. Meeting, Pusa, 1919, Calcutta, 1920, p. 315. Pl. 9, fig. *f*. Said to live in the pods of dhaincha (*Sesbania aegyptiaca*), destroying the seeds. Also recorded from "red gram pods" (*Cajamus indicus*) and from "agathi pods" (*Sesbania grandiflora*). India.

DECATOMIDEA COOKI Howard, Bur. Ent. Bull. Techn. ser. 2, 1896, p. 23. Reared from grape seeds collected at Lansing, Michigan. Four specimens from Vienna, Austria, reared from *Vitis californica* imported from California.

EURYTOMA ACACIAE Cameron, The Ent., vol. 43, 1910, p. 115. Infests seeds of *Acacia decurrens* in New Zealand.

EURYTOMA AMYGDALI Enderlein: Rodzianko, Kiev, 1913, 10 pp. (Rev. Appl. Ent., ser. A, vol. 2, 1914, p. 348); Lesne, Ann. Serv. Epiphyties, Paris, T. 6, 1919, p. 228–241, 14 figs. Infests mature seeds of almond in Bulgaria and plums and apricots in Astrachan.

EURYTOMA JUNIPERINUS Marcovitch, Ann. Ent. Soc. Amer., vol. 8, 1915, pp. 166–68. Tunnels in fleshy part of fruits of *Juniperus virginiana*, at Ithaca, New York.

EURYTOMA LARICIS Yano, Rept. For. Bur. Tokyo, 1914, pp. 35–58. Infests seeds of *Larix dahurica* in Japan.

EURYTOMA LONGIPENNIS (Walker): Weijenbergh, Arch. Neerl. Sci. Exact., 5, 1870, p. 420–7. Makes galls on *Ammophila arundinacea* (beach grass). Holland.

(*Isosoma*) EURYTOMA ORCHIDEARUM (Westwood),[2] Trans. Ent. Soc. Lond., 1882, p. 323, f. 13. Larvae injure buds of *Cattleya* in Brazil and Mexico. Known to occur as a pest of orchids in the United States also.

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[1]Specimens of this species were examined by Girault and given the manuscript name, *Eurytoma indi*. This identification was returned to the Government Entomologist of India, but so far as known no description of the species has ever been published by Girault. A later sending of material from the same source came into the hands of the writer, who was at the time unaware of Girault's manuscript name, and were described in 1919 as *Bruchophagus mellipes*. Subsequently Girault's type was discovered and found to be the same species. The description of *Bruchophagus mellipes* antedates the note and figure by Ramakrishna Ayyar. Hence, *Eurytoma indi* is a synonym of *Bruchophagus mellipes* and the synonym should be credited to Ayyar and not to Girault.

[2]Specimens believed to be this species are in the National Collection reared from orchids and are not *Harmolita* (= *Isosoma*) but belong more properly to *Eurytoma*.

EURYTOMA PATER Girault: Phillips, Journ. Econ. Ent., vol. 10, 1917, p. 145. Larva said to be a true parasite, in its early stages, of *Harmolita* (= *Isosoma*). Consumes host larva before completing more than one-third of its own growth and continues its development upon plant tissue. Ohio, Oklahoma, New York, Virginia.

EURYTOMA PHYTOPHAGA Girault, Treubia, vol. 1, no. 2, 1919, p. 55. From fruit of an orchid in Java. "This species has been reared by Doctor van Leeuwen from the fruits of the large earth orchid, *Rhajus* sp. This Chalcis seems to be truly phytophagous."—Roepke, Treubia, vol. 1, 1919, p. 60.

EURYTOMA PICUS Girault, The Ent., vol. 47, 1914, p. 53. Seems phytophagous, according to Girault, since he "found it inhabiting short grooves or channels under the bark of young *Eucalyptus* trees somewhat after the manner of Scolytidae. Where occurring the stems of the trees were somewhat swollen." Australia.

EURYTOMA RHOIS Crosby, Can. Ent., vol. 41, 1909, p. 52. Reared from seeds of *Rhus hirta* collected at Ithaca, and Taughannock Falls, New York.

EURYTOMA SAMSONOVI Vassiliev, Mem. Bur. Ent. Sci. Comm. Centr. Bd. Agr., Petrograd, vol. 11, 1915, 11 pp., 9 figs. (Rev. Appl. Ent., ser. A, vol. 3, 1915, p. 727.) In kernels of apricot in Ferghana.

EURYTOMA SCHREINERI Schreiner, Zeitschr. wiss. Insektb., 4, 1908, p. 26. Infests seeds of plum in Astrachan, Russia.

EURYTOMA(?) SP. da Costa Lima, Arch. Mus. Nac. Rio Janeiro, T. 19, 1916, p. 199. Phytophagous in seeds of *Psidium guayava* (guava) in Brazil.

EURYTOMA SP. Nielsen, Zeitschr. wiss. Insektb., Bd. 2, 1906, p. 46. Larva in first stages parasitic on *Cryptocampus angustus* on *Salix*, later phytophagous. Denmark.

EURYTOMOCHARIS ERAGROSTIDIS Howard, Bur. Ent. Bull. 2, Techn. ser. 1896, p. 21. Reared from stems of *Eragrostis poaeoides* from Lafayette, Indiana. Stems not at all or very slightly swollen. First or second joint below the head seems to be portion most commonly attacked.

EURYTOMOCHARIS TRIODIAE Howard, l. c., p. 21. From dry stems of *Triodia cuprea* from Virginia side of the Potomac near Washington, D. C.

EVOXYSOMA VITIS (Saunders): Crosby, Bul. 265, Cornell Univ. Agr. Exp. Sta., 1909, p. 380. Infests seeds of grape in Canada.

(*Isosoma*) HARMOLITA ACICULATUM (Schlechtendal), Jahresb. Ver. Nat. Zwickau, 1891 (1890), p. 10. Causes a scarcely noticeable swelling of stem above third or fourth node on *Stipa capillata*. Central Europe.

(*Isosoma* HARMOLITA AGROPYRI (Schlechtendal), Jahresb. Ver. Nat. Zwickau, 1891 (1890), p. 10; 1896 (1895), p. 7. Infests *Triticum repens* causing the leaf sheath above the nodes to be thickened and usually split on one side, showing on the inner side as long spindle-shaped galls. Central Europe.

HARMOLITA AGROPYROCOLA Phillips and Emery, Proc. U. S. Nat. Mus., vol. 55, 1919, p. 458. Is a gall-maker in stems of *Agropyron* sp. Salt Lake City, Utah.

HARMOLITA AGROPYROPHILA Phillips and Emery, Proc. U. S. Nat. Mus., vol. 55, 1919, p. 450. Inhabits the center of the stem and breeds only in species of *Agropyron*. United States from Atlantic west to Kansas.

(*Isosoma*) HARMOLITA AGROSTIDIS (Howard), U. S. Dept. Agr. Bur. Ent. Bull. 2, Techn. ser., 1896, p. 12. Reared from small galls occurring rarely upon *Agrostis* sp. in Placer County, California. Galls distinct elliptical swellings about 7–10 mm. long and from 2-3 mm. in greatest diameter and occurring upon different parts of the stalk. Placer County, California.

(*Isosoma*) HARMOLITA AIRAE (Schlechtendal), Jahresb. Ver. Nat. Zwickau, 1891 (1890), p. 7. Causes a scarcely noticeable swelling of stalk of *Aira caespitosa* Linné above first or second node. Central Europe.

HARMOLITA ALBOMACULATA (Ashmead): Phillips and Emery, Proc. U. S. Nat. Mus., vol. 55, 1919, p. 443. Inhabits the center of the stem and breeds only in timothy (*Phleum pratense*). Central and Eastern United States.

HARMOLITA APTERUM (Portchinsky): Rimsky-Korsakov, Mem. Bur. Ent. Sci. Comm. Centr. Bd. Land Admin. and Agr., St. Petersburg, vol. 10, 1914, p. 22 (Rev. Appl. Ent., ser. A, vol. 2, 1914, p. 472). Adults oviposit in internodes of summer and winter-sown wheat. Russia: Government of Cherson.

HARMOLITA ATLANTICA Phillips and Emery, Proc. U. S. Nat. Mus., vol. 55, 1919, p. 461. Infests species of *Agropyron* in which it forms galls. United States east of Mississippi River.

(*Isosoma*) HARMOLITA BRACHYPODII (Schlechtendal), Jahresb. Ver. Nat. Zwickau, 1891 (1890), p. 8. Causes a spindle-shaped swelling at top of stem with formation of a tuft of leaves on *Brachypodium pinnatum*. Central Europe.

(*Isosoma*) HARMOLITA BREVICORNE (Walker): Ashmead, Psyche, vol. 8, 1897, p. 138. Supposed to be a gall-maker on oats. Central Europe.

(*Isosoma*) HARMOLITA BRISCHKEI (Schlechtendal), Jahresb. Ver. Nat. Zwickau, 1891 (1890), p. 8. Questionably a gall-maker in stems of *Elymus arenarius* Linné. Central Europe.

(*Isosoma*) HARMOLITA BROMI (Howard), U. S. Dept. Agr. Bur. Ent. Bull. 2, Techn. ser. 1896, p. 11. Reared from *Bromus ciliatus*. Los Angeles, California.

(*Isosoma*) HARMOLITA BROMICOLA (Howard), U. S. Dept. Agr. Bur. Ent. Bull. 2, Techn. ser., 1896, p. 16. Reared from *Bromus ciliatus*. Los Angeles County, California.

(*Eurytoma*) HARMOLITA CALAMAGROSTIDIS (Schlechtendal), Jahresb. Ver. Nat. Zwickau, 1891 (1890), p. 8; Reuter, Med. Soc. Faun. Flor. Fenn., 23, 1908, p. 65. (German summary, p. 208.) Makes galls on *Calamagrostis epigejos* (Linné). Galls red, frequently showing a hardly noticeable, long spindle-shaped, sometimes weakly transversely wrinkled, tubercle-like swelling on the stalk between the upper nodes and the flower pannicle. The gall contains several small, longitudinal larval cells one behind the other. Central Europe.

HARMOLITA CAPTIVA (Howard): Phillips and Emery, Proc. U. S. Nat. Mus., vol. 55, 1919, p. 444. Makes inconspicuous galls near the base of the seed stalks of blue grass (*Poa pratensis*). Known only from Illinois and Indiana.

(*Isosoma*) HARMOLITA CYLINDRICUM (Schlechtendal), Jahresb. Ver. Nat. Zwickau, 1891 (1890), p. 10. Forms long, spindle-shaped fruit-galls on

Stipa capillata, causing mixing of flower parts with fruit glume and scattering of the grain. Central Europe.

HARMOLITA DACTYLICOLA Phillips and Emery, Proc. U. S. Nat. Mus., vol. 55, 1919, p. 446. Inhabits the center of the stem and breeds only in orchard grass (*Dactylis glomerata*). United States east of Mississippi River.

(*Isosoma*) HARMOLITA DEPRESSUM (Walker): Schlechtendal, Jahresb. Ver. Nat. Zwickau, 1891 (1890), p. 8. Causes tubular, irregular, usually yellowish green swelling of stalk above first or second node on *Festuca ovina*. Central Europe.

HARMOLITA ELYMI (French): Phillips and Emery, Proc. U. S. Nat. Mus., vol. 55, 1919, p. 447. Inhabits the center of the stem and breeds only in spurs of *Elymus* sp. United States.

HARMOLITA ELYMICOLA Phillips and Emery, Proc. U. S. Nat. Mus., vol. 55, 1919, p. 460. Makes very conspicuous galls in stems of *Elymus* sp., usually at the second or third internode from the base of the plant. Indiana and Virginia.

HARMOLITA ELYMIVORA Phillips and Emery, Proc. U. S. Nat. Mus., vol. 55, 1919, p. 464. Makes inconspicuous galls near the head of species of *Elymus*. United States east of the Mississippi River.

HARMOLITA ELYMOPHILA Phillips and Emery, Proc. U. S. Nat. Mus., vol. 55, 1919, p. 462. Makes inconspicuous galls in species of *Elymus*. California.

HARMOLITA ELYMOPTHORA Phillips and Emery, Proc. U. S. Nat. Mus., vol. 55, 1919, p. 465. Forms galls in the stems of the species of *Elymus*. Minot, North Dakota.

HARMOLITA ELYMOXENA Phillips and Emery, Proc. U. S. Nat. Mus., vol. 55, 1919, p. 459. Reared from *Elymus americanus*. Santa Cruz Mountains, California.

(*Isosoma*) HARMOLITA EREMITUM (Portchinsky): Rimsky-Korsakov, Mem. Bur. Ent. Sci. Comm. Centr. Bd. Land Admin. and Agr., St. Petersburg, vol. 10, no. 11, 1914, p. 20. (Rev. Appl. Ent., ser. A, vol. 2, 1914, p. 471.) Inhabits stems of rye, usually at the fourth internode. Russia: Government of Cherson.

(*Isosoma*) HARMOLITA EREMITUM (Portchinsky) var. NODALE Rimsky-Korsakov. (See *eremitum*.)

HARMOLITA FESTUCAE Phillips and Emery, Proc. U. S. Nat. Mus., vol. 55, 1919, p. 454. Breeds only in species of *Festuca*, making conspicuous hardened enlargements or galls in the second to fourth internode from the base of the plants. Virginia.

(*Isosoma*) HARMOLITA GIRAUDI Schlechtendal, Jahresb. Ver. Nat. Zwickau, 1891 (1890), p. 8. Makes scarcely noticeable swelling above second or third node on *Festuca gigantea* Vill. Central Europe.

(*Isosoma*) HARMOLITA GRAMINICOLA (Giraud): Schlechtendal, Jahresb. Ver. Nat. Zwickau, 1891 (1890), p. 10. Causes thickening of stem tip and by shortening of internodes causes bunching of leaves on *Triticum repens* and *Triticum junceum*. Central Europe.

HARMOLITA GRANDIS form GRANDIS (Riley) and form MINUTA (Riley): Phillips and Emery, Proc. U. S. Nat. Mus., vol. 55, 1919, p. 440. Inhabits the center of the stem of wheat. North America wherever wheat is grown.

(*Isosoma*) HARMOLITA HAGENI (Howard), U. S. Dept. Agr. Bur. Ent. Bull. 2, Techn. ser., 1896, p. 12. "In quick grass." Boston, Massachusetts.

HARMOLITA HESPERUS Phillips and Emery, Proc. U. S. Nat. Mus., vol. 55, 1919, p. 457. Gall-former on species of *Elymus*. Holliday, Utah.

(*Isosoma*) HARMOLITA HIERONYMI (Schlechtendal), Jahresb. Ver. Nat. Zwickau, 1891 (1890), p. 8. Causes a spindle-shaped, more or less bulging yellowish stem gall above second or third node on *Festuca glauca* Schrad. Central Europe.

HARMOLITA HORDEI (Harris).[1] Phillips and Emery, Proc. U. S. Nat. Mus., vol. 55, 1919, p. 452. Gall-former in stems of barley making conspicuous hardened enlargements above the second to fourth nodes. Auburn and Little Falls, New York.

(*Isosoma*) HARMOLITA HYALIPENNE (Walker): Schlechtendal, Jahresb. Ver. Nat. Zwickau, 1891 (1890) p. 7. Causes thickening of tops of young shoots of *Ammophila arenaria*, and through shortening of internodes causes crowding of leaves. Central Europe.

(*Isosoma*) HARMOLITA INQUILINUM Rimsky-Korsakov, Mem. Bur. Ent. Sci. Comm. Centr. Bd. Land Admin. and Agr. St. Petersburg, vol. 10, no. 11, 1914, p. 19. (Rev. Appl. Ent., ser. A, vol. 2, 1914, p. 471). Oviposit in galls of *Harmolita rossicum* on wheat, and larvae in first stage attack and kill those of gall-maker, and then finish development phytophagically. Russia: Government of Cherson.

(*Isosoma*) HARMOLITA MACALUSOI (Stefani Perez), Marcellia, vol. 7, 1908, p. 148. Produces galls on *Sideroxylon* sp. with hypertrophy of leaf parenchyma. Italian Somaliland.

HARMOLITA MACULATA (Howard): Phillips and Emery, Proc. U. S. Nat. Mus., vol. 55, 1919, p. 449. Inhabits the center of the stem and breeds only in cheat (*Bromus secalinus*) and other species of *Bromus*. United States east of the Mississippi River.

(*Isosoma*) HARMOLITA NOXIALE (Portchinsky); Rimsky-Korsakov, Mem. Bur. Ent. Sci. Comm. Centr. Bd. Land Admin. and Agr., St. Petersburg, vol. 10, no. 11, 1914, p. 18. (Rev. Appl. Ent., ser. A, vol. 2, 1914, p. 471.) Inhabits center of stems of wheat at third and fourth internodes. Russia: Government of Cherson.

HARMOLITA OCCIDENTALIS Phillips and Emery, Proc. U. S. Nat. Mus., vol. 55, 1919, p. 466. Makes inconspicuous galls near head of species of *Agropyron*. Koehler, New Mexico.

HARMOLITA OVATA Phillips and Emery, Proc. U. S. Nat. Mus., vol. 55, 1919, p. 459. Forms galls on species of *Elymus*. Wellington, Kansas.

HARMOLITA PHYLLOTACHITIS Gahan, described beyond. Inhabits center of the stem of young growth of bamboo, *Phyllotachys bambusoides*. Florida.

(*Isosoma*) HARMOLITA POAE Schlechtendal, Jahresb. Ver. Nat. Zwickau, 1891

[1]Hedicke, Deutsche Ent. Zeitschr., 1919, p. 205–6 (Rev. Appl. Ent., ser. A, vol. 9, 1921, p. 92), records *Isosoma lineare* Walker and *Isosoma agropyri* Schlechtendal as synonyms of this species and states that it infests wheat, rye, and grass. Also states habits vary with food plant. Hedicke has probably confused three different species.

(1890), p. 9. Causes a hard spindle-shaped, longitudinally striate, yellow green, swelling of stalk of *Poa nemoralis*. Central Europe.

HARMOLITA POACOLA Gahan (n. n. for *poae* Phillips and Emery not Schlechtendal): Phillips and Emery, Proc. U. S. Nat. Mus., vol. 55, 1919, p. 445. Inhabits the center of the stem in the seed stalks of blue grass (*Poa pratensis*). Lafayette, Indiana.

HARMOLITA POOPHILA Phillips and Emery, Proc. U. S. Nat. Mus., vol. 55, 1919, p. 463. Reared from galls in *Poa lucida*. Husted, Colorado.

(*Isosoma*) HARMOLITA ROSSICUM Rimsky-Korsakov, Mem. Bur. Ent. Sci. Comm. Centr. Bd. Land Admin. and Agr., St. Petersburg, vol. 10, no. 11, 1914, p. 15. (Rev. Appl. Ent., ser. A, vol. 2, 1914, p. 470.) Infests stems of rye and wheat. Russia: Government of Cherson.

HARMOLITA RUFIPES Phillips and Emery, Proc. U. S. Nat. Mus., vol. 55, 1919, p. 453. Forms inconspicuous galls in the internode just below the head of *Elymus* sp. There is often no external enlargement of the stem where the galls occur. Central United States.

(*Isosoma*) HARMOLITA SCHEPPIGI Schlechtendal, Jahresb. Ver. Nat. Zwickau, 1891 (1890), p. 10. Infests *Stipa pennata* Linné, causing a spindle-shaped two- or three-winged swelling of the bud axil which is abnormally lengthened. Central Europe.

HARMOLITA SECALIS (Fitch): Phillips and Emery, Proc. U. S. Nat. Mus., vol. 55, 1919, p. 456. Makes conspicuous hardened enlargements or galls usually in the second or third internodes from the base of the rye plant. Lafayette, Indiana, and Warsaw, Poland.

(*Isosoma*) HARMOLITA STIPAE Stefani Perez, Nuovo Giorn. Bot. Ital., Firenze, vol. 8 (n. s.), 1901, p. 543. Infests *Stipa tortilis* Desfontaines, producing graceful, cylindrical, more or less fusiform galls upon the ovaries when the grain is the size of a pea or a little less. The gall at first is green, becoming red later, and on reaching maturity, straw color. The walls are polished, thick, resistant, and contain a narrow and elongate larval chamber. Sicily.

HARMOLITA TRITICI (Fitch): Phillips and Emery, Proc. U. S. Nat. Mus., vol. 55, 1919, p. 451. Makes conspicuous hardened enlargements or galls in wheat stems, usually about the second or third internode from the base of the plant, though they may occur at every internode. Central and Eastern United States.

HARMOLITA VAGINICOLA (Doane): Phillips and Emery, Proc. U. S. Nat. Mus., vol. 55, 1919, p. 455. Gall-former in wheat making a conspicuous hardened enlargement in the sheath surrounding the head. North America from Atlantic coast to Rocky Mountains.

HARMOLITA WEBSTERI (Howard): Phillips and Emery, Proc. U. S. Nat. Mus., vol. 55, 1919, p. 442. Inhabits the center of the stem and breeds only in rye. United States from Atlantic to Pacific.

(*Isosoma*) HARMOLITA sp. (Rübsaamen in lit.): Schlechtendal, Jahresb. Ver. Nat. Zwickau, 1896 (1895), p. 5. Makes scarcely noticeable swelling in pithy stems of *Arundo phragmites*. Central Europe.

(*Isosoma*) HARMOLITA sp. (Kieffer): Schlechtendal, Jahresb., Ver. Nat. Zwickau, 1896 (1895), p. 6. Infests stem of *Festuca duriuscula* causing slight swelling. Central Europe.

(*Isosoma*) HARMOLITA SP. (Rübsaamen): Schlechtendal, Jahresb. Ver. Nat. Zwickau, 1896 (1895), p. 5. Causes weakly spindel-shaped swelling above a node in the stem of *Calamagrostis lanceolata* Roth. Central Europe.

(*Isosoma*) HARMOLITA SP. (Schlechtendal), Jahresb. Ver. Nat. Zwickau, 1896 (1895), p. 7. Causes a short, thick, spindle-shaped swelling in stems of *Triticum repens*. Central Europe.

(*Isosoma*) HARMOLITA SP. (Schlechtendal), Jahresb. Ver. Nat. Zwickau, 1896 (1895), p. 7. Causes a thick knot-shaped swelling above a node in stem of *Triticum repens*. Central Europe.

(*Isosoma*) HARMOLITA SP. (Schlechtendal), Jahresb. Ver. Nat. Zwickau, 1896 (1895), p. 7. Inhabits a long, spindle-shaped swelling in stems of *Triticum repens*. Central Europe.

(*Isosoma*) HARMOLITA SP. (Schlechtendal), Jahresb. Ver. Nat. Zwickau, 1896 (1895), p. 7. Causes a knot-shaped swelling close above the stem nodes of *Triticum repens*. Central Europe.

(*Isosoma*) HARMOLITA SP. (Schlechtendal), Jahresb. Ver. Nat. Zwickau, 1896 (1895), p. 7. Inhabits a hardly noticeable swelling above the node in stems of *Triticum repens*. Central Europe.

ISOSOMA Walker.[1] See *Harmolita*.

ISOSOMA ORCHIDEARUM Westwood. See *Eurytoma orchidearum* (Westwood).

ISOSOMORPHA MUHLENBERGIAE Howard, Bur. Ent. Bull. 2, Techn. ser, 1896, p. 20. Reared from gall on *Muhlenbergia diffusa*, from Cadet, Missouri, closely resembling deformation made by *Isosoma hordei*.

PRODECATOMA PHYTOPHAGA Crosby, Can. Ent., vol. 41, 1909, p. 50. Reared from seeds of *Parthenocissus quinquefolia* from Ithaca, and Taughannock Falls, New York.

PRODECATOMA SP. da Costa Lima, Arch. Mus. Nac. Rio Janeiro, T. 19, 1916, p. 199. Phytophagous in seeds of *Psidium* (guava) in Brazil.

Family **ENCYRTIDAE.**

MINAPIS NIGRA Brèthes, An. Mus. Nac. Hist. Nat. Bs. As., T. 27, 1916, p. 422. Produces rather large spherical or elongate galls on the branches of *Scutia buccifolia* in Argentina.

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[1]As indicated by Phillips and Emery (Proc. U. S. Nat. Mus., vol. 55, 1919, p. 435) *Isosoma* Walker is preoccupied in Coleoptera by *Isosoma* Billberg, making it necessary to substitute the generic name *Harmolita* Motschulsky for that of *Isosoma*. Phillips and Emery restricted *Harmolita* to those species of Isosoma having no umbilicate punctures and a non-carinate occiput. The effect of this was to leave many species formerly placed in *Isosoma* without a generic name. Inasmuch as it is impossible to determine from the description of many species whether they would fall within or without this restricted definition, the writer has considered it better, for the purposes of this paper, to treat *Harmolita* as the full equivalent of *Isosoma* Walker et Auct.

Family **PERILAMPIDAE.**

ASPARAGOBIUS BRAUNSI Mayr, Verh. Zool. Bot. Ges. Wien, vol. 55, 1905, p. 553. Gall-maker on *Asparagus striatus* in Cape Colony, South Africa.

MAYRELLUS MIRABILIS Crawford, Proc. U. S. Nat. Mus., vol. 39, 1910, p. 238. Reared from galls on an unknown plant from Ceara, Brazil, and said to be the probable gall-maker.

MONOPLEUROTHRIX KIEFFERI Mayr, Marcellia, vol. 4, 1905, p. 79. Gall-maker on an unknown plant from Paraguay.

PERILAMPOIDES BICOLOR Girault, Mem. Queensland Mus., vol. 2, 1913, p. 302. Makes small round isolated galls on the foliage of *Eucalyptus* in Australia.

TRICHILOGASTER ACACIAE-DISCOLORIS (Froggatt), Proc. Linn. Soc. N. S. Wales, vol. 7, 1892, p. 153; Girault, Mem. Queensland Mus., vol. 5, 1916, p. 222. Gall-maker on twigs of *Acacia discolor* in Australia.

TRICHILOGASTER ACACIAE-LONGIFOLIAE (Froggatt), Proc. Linn. Soc. N. S. Wales, vol. 7, 1892, p. 154; Mayr, Verh. Zool. Bot. Ges. Wien, vol. 55, 1905, p. 560. Gall-maker on flower stalks of *Acacia longifolia* in Australia.

TRICHILOGASTER MAIDENI (Froggatt), Proc. Linn. Soc. N. S. Wales, vol. 7, 1892, p. 155; Mayr, Verh. Zool.-Bot. Ges. Wien, vol. 55, 1905, p. 558. Gall-maker on twigs and small branches of *Acacia longifolia* in Australia.

TRICHILOGASTER PENDULAE Mayr, Verh. Zool. Bot. Ges. Wien, vol. 55, 1905, p. 560. Gall-maker on axillary buds of *Acacia pendula* in Australia.

RELATED GENERA OF PERILAMPIDAE. *Epiperilampus* Girault (= *Trichilogaster* according to Girault), *Melanosomella* Girault (= *Terobiella* Ashmead according to Girault), *Coelocybomyia* Girault (= *Coelocyba* Ashmead according to Girault), *Brachyscelidiphaga* Ashmead, *Paracoelocyba* Girault, *Coelocybelloides* Girault, *Perilampomyia* Girault, *Parelatus* Girault, *Neoperilampus* Girault, *Eucoelocybomyia* Girault, *Coelocybella* Girault, *Perilampella* Girault, *Euperilampus* Girault, *Epichrysomalla* Girault, and *Parachrysomalla* Girault, are all placed in this group by Girault (Mem. Queensland Mus., vol. 2, 1913, p. 300–302; vol. 3, 1915, p. 303–310; and vol. 5, 1916, p. 222–226). Among the numerous species recorded in these genera are many reared from galls on various plants in Australia. Doubtless many and perhaps all will eventually be found to be actual gall producers.

Family **EULOPHIDAE.**

GENIOCERUS JUNIPERI Crawford, Proc. U. S. Nat. Mus., vol. 48, 1915, p. 585; Marcovitch, Ann. Ent. Soc. Amer., vol. 8, 1915, p. 169. Tunnels in the flesh of berries of *Juniperus virginiana* at Ithaca, New York.

RHICNOPELTELLA EUCALYPTI Gahan, new species described beyond. Said to be a gall-maker on *Eucalyptus globulus* in New Zealand.

RHICNOPELTELLA SPP. (Several species have been described by Girault in the genus *Rhicnopeltella* from Australia and at least two of these are recorded from galls on *Eucalyptus*, but without indication that they were the producers of the galls. If the above record is correct it seems probable that other species of the genus may prove to have similar habits.)

ZAGRAMMOSOMOIDES FASCIATUS Girault, The Entom., vol. 47, 1913, p. 177. Reared in enormous numbers, according to Girault, from globular green galls on the foliage of bloodwood gum (*Eucalyptus* sp.) in Australia. Girault concludes his remarks with the statement: "This Eulophid appears to be a true gall-making species."

HOST PLANT LIST.

The writer is indebted to Dr. Paul C. Standley of the U. S. National Museum for having checked over the botanical names in the following list and brought the nomenclature down to date.

PLANT.	CHALCIDOID.
ABIES AMABILIS Loud.	*Megastigmus pinus* Parfitt.
	spermotrophus Wachtl.
CONCOLOR Gord.	*Megastigmus pinus* Parfitt.
	spermotrophus Wachtl.
GRANDIS Lindley	*Megastigmus pinus* Parfitt.
	spermotrophus Wachtl.
LASIOCARPA Hooker	*Megastigmus lasiocarpae* Crosby.
MAGNIFICA Murray	*Megastigmus pinus* Parfitt.
	spermotrophus Wachtl.
MARIESI Mast	*Megastigmus borriesi* Crosby.
NOBILIS Lindley	*Megastigmus pinus* Parfitt.
PECTINATA Poiret = Abies picea, q. v.	
PICEA Lindley	*Megastigmus strobilobius* Ratzeburg.
SHASTENSIS Lemmon	*Megastigmus spermotrophus* Wachtl.
ACACIA DECURRENS Willdenow	*Eurytoma acaciae* Cameron.
DISCOLOR Willdenow	*Trichilogaster acaciae-discoloris* (Froggatt).
LONGIFOLIA Willdenow	*Trichilogaster acaciae-longifoliae* (Froggatt).
	maideni (Froggatt).
PENDULA Cunningham	*Trichilogaster pendulae* Mayr.
AGATHI PODS see Sesbania grandiflora.	
AGROPYRON JUNCEUM (Linné) Beauv.	*Harmolita graminicola* Giraud.
REPENS (Linné) Beauv.	*Harmolita agropyri* (Schlechtendal).
	agropyrophila Phillips and Emery.
	graminicola Giraud.
	spp. (Schlechtendal).

AGROPYRON (cont.)
?REPENS (Linné) Beauv. . . . . *Harmolita hageni* (Howard).
SPP. . . . . *Harmolita agropyrocola* Phillips and Emery.
atlantica Phillips and Emery.
occidentalis Phillips and Emery.
AGROSTIS sp. . . . . *Harmolita agrostidis* (Howard).
AIRA CAESPITOSA Linné . . . . . *Harmolita airae* (Schlechtendal).
ALFALFA see Medicago sativa.
ALMOND see Prunus amygdalus.
AMELANCHIER CANADENSIS (Linné) Medic. *Megastigmus amelanchieris* Cushman.
Syntomaspis amelanchieris Cushman.
AMMOPHILA ARENARIA (Linné) Link . . . *Eurytoma longipennis* Walker.
Harmolita hyalipenne (Walker).
AMYGDALUS COMMUNIS (Linné) Fritsch
= Prunus amygdalus Stokes, q. v.
ANONA SPP. . . . . *Bephrata cubensis* Ashmead.
paraguayensis Crawford.
APPLE see Pyrus spp.
APRICOT see Prunus armeniaca Linné.
ARUNDO PHRAGMITES Linné
= Phragmites communis Trinius, q. v.
ASPARAGUS STRIATUS Thunb. . . . . *Asparagobius braunsi* Mayr.
AVENA SATIVA Linné . . . . . *Harmolita brevicorne* Walker.
BAMBOO see Phyllotachys bambusoides.
BARLEY see Hordeum.
BEACH GRASS see Ammophila arenaria Linné.
BLOODWOOD GUM see Eucalyptus.
BLUEGRASS see Poa pratensis.
BRACHYPODIUM PINNATUM (Linné) Beauv. *Harmolita brachypodii* (Schlechtendal).
BROMUS CILIATUS Linné . . . . . *Harmolita bromi* (Howard).
bromicola (Howard).
SECALINUS Linné . . . . . *Harmolita maculata* (Howard).
SPP. . . . . *Harmolita maculata* (Howard).
CAJANUS INDICUS Sprengel . . . . . *Bruchophagus mellipes* Gahan.
CALAMAGROSTIS EPIGEJOS (Linné) Roth . *Harmolita calamagrostidis* (Schlechtendal).
LANCEOLATA Roth . . . . . *Harmolita* sp. (Rübsaamen).
CATTLEYA SPP. . . . . *Eurytoma orchidearum* (Westwood).
CHAMAECYPARIS OBTUSA Sieb. and Zucc. . *Megastigmus cryptomeriae* Yano.
CHEAT see Bromus secalinus.
CLOVER see Trifolium.
CRYPTOMERIA JAPONICA Don. . . . . *Megastigmus cryptomeriae* Yano.
DACTYLIS GLOMERATA Linné . . . . . *Harmolita dactylicola* Phillips and Emery.

DHAINCHA see Sesbania aegyptiaca.
DOUGLAS FIR see Pseudotsuga.
EARTH ORCHID see Phajus sp.
ELYMUS AMERICANUS Vasey & Scribner
=E. glaucus Buckley, q. v.
ARENARIUS Linné . . . . . *Harmolita brischkei* (Schlechtendal).
GLAUCUS Buckley . . . . . *Harmolita elymoxena* Phillips and Emery.
SPP. . . . . *Harmolita elymi* (French).
elymicola Phillips and Emery.
elymivora Phillips and Emery.
elymophila Phillips and Emery.
elymopthora Phillips and Emery.
hesperus Phillips and Emery.
ovata Phillips and Emery.
rufipes Phillips and Emery.
ERAGROSTIS POAEOIDES Beauvois . . . . *Eurytomocharis eragrostidis* Howard.
EUCALYPTUS GLOBULUS Labill . . . . . *Rhicnopeltella eucalypti* Gahan.
SPP. . . . . *Eurytoma picus* Girault.
Perilampoides bicolor Girault.
Rhicnopeltella spp. Girault.
Zagrammosomoides fasciatus Girault.
FESTUCA DURIUSCULA Linné . . . . . *Harmolita* sp. (Kieffer).
GIGANTEA (Linné) Vill. . . . . *Harmolita giraudi* (Schlechtendal).
FESTUCA GLAUCA Lamark . . . . . *Harmolita hieronymi* (Schlechtendal).
OVINA Linné . . . . . *Harmolita depressum* (Walker).
SP. . . . . *Harmolita festucae* Phillips and Emery.
FICUS . . . . . *Agaonidae.*
FIR see Abies.
GRAPE see Vitis.
GUAVA see Psidium.
HEMLOCK see Tsuga.
HORDEUM SATIVUM Linné . . . . . *Harmolita hordei* (Harris).
JUNIPERUS VIRGINIANA Linné . . . . . *Eurytoma juniperinus* Marcovitch.
Geniocerus juniperi Crawford.
LARCH see Larix.
LARIX DAHURICA Turcz . . . . . *Eurytoma laricis* Yano.
LARICINA (Du Roi) Koch . . . . *Megsatigmus laricis* Marcovitch.
LEPTOLEPIS Murray . . . . . *Megastigmus inamurae* Yano.
MEDICAGO SATIVA Linné . . . . . *Bruchophagus funebris* Howard.

MOUNTAIN ASH see Sorbus.
MUHLENBERGIA DIFFUSA Willdenow
= M. schreberi Gmelin, q. v.
SCHREBERI Gmelin . . . . . *Isosomorpha muhlenbergiae* Howard.
OATS see Avena sativa.
OPULASTES OPULIFOLIUS (Linné) Kuntze . *Megastigmus physocarpi* Crosby.
ORCHARD GRASS see Dactylis glomerata.
ORCHID see Cattleya.
PARTHENOCISSUS QUINQUEFOLIA (Linné)
Planch . . . . . *Prodecatoma phytophaga* Crosby.
PHAJUS SP. . . . . *Eurytoma phytophaga* Girault.
PHLEUM PRATENSE Linné . . . . . *Harmolita albomaculata* (Ashmead).
PHRAGMITES COMMUNIS Trinius . . . . *Harmolita* sp. (Rübsaamen).
PHYLLOTACHYS BAMBUSOIDES Sieb. and
Zucc. . . . . *Harmolita phyllotachitis* Gahan.
PHYSOCARPUS OPULIFOLIUS (Linné) Maxim
= Opulastes opulifolius (Linné) Kuntze, q. v.
PICEA ENGELMANNI (Parry) Engelmann . *Megastigmus piceae* Rohwer.
PARRYANA André
= Picea pungens Engelmann, q. v.
PUNGENS Engelmann . . . . . *Megastigmus piceae* Rohwer.
SITCHENSIS Bong. . . . . *Megastigmus piceae* Rohwer.
PINE see Pinus.
PINUS PONDEROSA Dougl. . . . . *Megastigmus albifrons* Walker.
PISTACIA LENTISCUS Linné . . . . . *Megastigmus pistaciae* Walker.
TEREBINTHUS Linné . . . . . *Megastigmus ballestrerii* (Rondani).
VERA Linné . . . . . *Megastigmus ballestrerii* (Rondani).
PLUM see Prunus spp.
POA LUCIDA Vasey . . . . . *Harmolita poophila* Phillips and Emery.
NEMORALIS Linné . . . . . *Harmolita poae* (Schlechtendal).
PRATENSIS Linné . . . . . *Harmolita captiva* Howard.
poacola Gahan.
PRUNUS AMYGDALUS Stokes . . . . . *Eurytoma amygdali* Enderlein.
ARMENIACA Linné . . . . . *Eurytoma amygdali* Enderlein.
samsonovi Vassiliev.
SPP. . . . . *Eurytoma amygdali* Enderlein.
schreineri Schreiner.
PSEUDOTSUGA MUCRONATA (Raf.) Sudw. . *Megastigmus spermotrophus* Wachtl.
TAXIFOLIA (Poiret) Britton
= P. mucronata (Rafinesque), q. v.
PSIDIUM GUAJAVA Linné . . . . . *Syntomaspis myrtacearum* Costa Lima.
SPP. . . . . *Eurytoma* sp. Costa Lima.
Prodecatoma sp. Costa Lima.
PYRUS SPP. . . . . *Syntomaspis druparum* Boheman.

"Quick grass" see Agropyron? repens (Linné).
Red gram see Cajanus indicus.
Rhus hirta (Linné) Sudworth . . . . *Eurytoma rhois Crosby.*
Rosa rugosa Thunb. . . . . *Megastigmus nigrovariegatus* Ashmead.
spp. . . . . *Megastigmus aculeatus* (Swederus).
pictus (Förster).
Rose see Rosa.
Rye see Secale cereale.
Salix alba Linné . . . . . *Eurytoma* sp. Nielsen.
purpurea Linné . . . . . *Eurytoma* sp. Nielsen.
Scutia buccifolia Reiss . . . . . *Minapis nigra* Brèthes.
Secale cereale Linné . . . . . *Harmolita eremitum* (Portchinsky).
var. *nodale* (Portchinsky).
rossicum Rimsky-Korsakov.
secalis (Fitch).
websteri (Howard).
Service berry see Amelanchier.
Sesbania aegyptiaca Poiret . . . . *Bruchophagus mellipes* Gahan.
grandiflora . . . . . *Bruchophagus mellipes* Gahan.
Sideroxylon sp. . . . . *Harmolita macalusoi* (Stefani).
Sorbus aucuparia Linné . . . . . *Megastigmus brevicaudis* Ratzeburg.
Syntomaspis aucupariae Rodzianko.
sp. . . . . *Megastigmus brevicaudis* Ratzeburg.
Syntomaspis druparum Boheman.
Spruce see Picea.
Stipa capillata Linné . . . . . *Harmolita aciculatum* (Schlechtendal).
cylindricum (Schlechtendal).
pennata Linné . . . . . *Harmolita scheppigi* Schlechtendal.
tortilis Desfontaines . . . . *Harmolita stipae* (Stefani).
Thujopsis dolobrata Sieb. and Zucc. . *Megastigmus thuyopsis* Yano.
Timothy see Phleum pratense.
Trifolium spp. . . . . *Bruchophagus funebris* Howard.
Triodia cuprea (Walt.) Chapm.
= T. flava (Linné) Hetche, q. v.
flava (Linné) Hetche . . . . *Eurytomocharis triodiae* Howard.
Triticum junceum
= Agropyron junceum, q. v.
repens
= Agropyron repens, q. v.
aestivum Linné *Eurytoma pater* Girault.
Harmolita apterum (Portchinsky).
grandis form *grandis* (Riley).
minuta (Riley).

TRITICUM AESTIVUM (cont.)	*inquilinum* Rimsky-Korsakov).
	noxiale (Portchinsky).
	rossicum (Rimsky-Korsakov).
	tritici (Fitch).
	vaginicola (Doane).
TSUGA MERTENSIANA HOOKERIANA (Bong.) = T. mertensiana (Bong.) Sargent, q. v.	
MERTENSIANA (Bong.) Sargent . .	*Megastigmus tsugae* Crosby.
SIEBOLDII Carr	*Callimome tsugae* Yano.
SP.	*Megastigmus pinus* Parfitt.
UNKNOWN PLANTS	*Mayrellus mirabilis* Crawford.
	Monopleurothrix kiefferi Mayr.
VITIS CALIFORNICA Bentham	*Decatomidea cooki* Howard.
SPP.	*Decatomidea cooki* Howard.
	Evoxysoma vitis (Saunders).

WHEAT see Triticum aestivum.
WILLOW see Salix.

NEW SPECIES.

Family EULOPHIDAE.

Rhicnopeltella eucalypti, new species.
(Pl. 7, Fig. 1, 1a, 1b.)

This species seems to be very close to *purpurea* Girault but differs from the description of that species in having the anterior tibiae pale in front and black behind instead of pale throughout, the knees not at all pale, and the antennal joints somewhat differently proportioned.

Female.—Length 1.6 mm. Head, thorax, and abdomen with fine shallow, reticulate-punctate sculpture, subopaque; vertex broad; ocelli in a low triangle, widely separated, the posterior ocelli separated from the eye margin by about the diameter of an ocellus; the antennae very short, 11-jointed, strongly clavate; pedicel large, approximately twice as long as thick and half as long as the scape; funicle 6-jointed, not longer than the pedicel, joints all transverse and increasing gradually in width toward the club, the first four joints of funicle ring-like and nearly equal in length, joint five approximately twice as long as four, joint six a little more than twice as long as five; club ovate, distinctly much broader than the funicle, about four-fifths as long as the scape, nearly twice as long as funicle, distinctly 3-jointed, broadest at apex of first joint, and tapering gradually to apex; distal club joint longer than the last funicle joint; parapsidal grooves deep, complete, short and sharply curved outward, the scapulae short; scutellum rather large, almost as long as the mesoscutum and only slightly convex; propodeum very short, medially barely longer than the postscutellum, sculptured like the rest of thorax; marginal vein rather thick, not quite twice as long as the rather long stigmal; postmarginal distinctly longer than the stigmal, tapering

gradually from the base until lost in the margin of wing; hind femora a little thickened; hind tibiae with one spur; apical joint of hind tarsi as long as the metatarsus; tarsal joints 2 and 3 subequal and shorter than the others; claws very short, blunt at apex; pulvilli large; abdomen not longer than the thorax, subspherical, not at all pointed at apex, the ovipositor not exserted. Black, faintly tinged with purplish on the thorax; antennal club grayish; anterior tibiae pale in front, black behind; middle and hind tarsi pale except the apical joint which is dark; rest of the legs concolorous with the body; wings mostly hyaline but a faint duskiness behind the marginal vein; venation grayish black.

Male.—Unknown.

Type locality.—Wellington, New Zealand.

Type.—Cat. No. 24372, U. S. Nat. Mus.

Described from twenty-nine females received from David Miller and reared by him from galls on *Eucalyptus globulus*. According to the collector "There is no doubt that the galls are the work of the Chalcid itself and the pest has now become extremely widespread and serious." Mr. Miller does not indicate on what part of the plant the galls occur.

Family **EURYTOMIDAE.**

Tribe HARMOLITINI.

Harmolita phyllotachitis, new species.

(Pl. 7, Fig. 2, 2a.)

This species runs straight in Ashmead's Classification to the genus *Harmolita* (=*Isosoma*) but does not fall wholly within that genus as restricted by Phillips and Emery[1] on account of the partly umbilicate punctuation of the thorax. The abdominal petiole is also unusually prominent for members of this genus and the antennal funicle is apparently 6-jointed instead of 5-jointed as in typical *Harmolita*. The agreement in other characters is so close, however, and the habits apparently so similar that it does not seem advisable at this time to erect a new genus for it, especially in view of the fact that differences pointed out are purely relative ones which would probably break down as other species are discovered.

Female.—Length 5.5 mm. An elongate rather slender species. Head broader than thorax, convex in front, concave behind, strongly rugulose-punctate but without distinct umbilicate punctures, a narrow median area below antennae and a space below the eye nearly smooth, the area surrounding ocelli more finely sculptured than the face; occiput immargined, ocelli in a low triangle, postocellar and ocellocular lines subequal; viewed from in front the head is slightly broader than long, subcircular in outline; malar space subequal in length to the height of eye; antennal depression moderately deep and rather narrow; antennae 11-jointed, the flagellum scarcely at all clavate; pedicel

[1]Proc. U. S. Nat. Mus., vol. 55, 1919, p. 435.

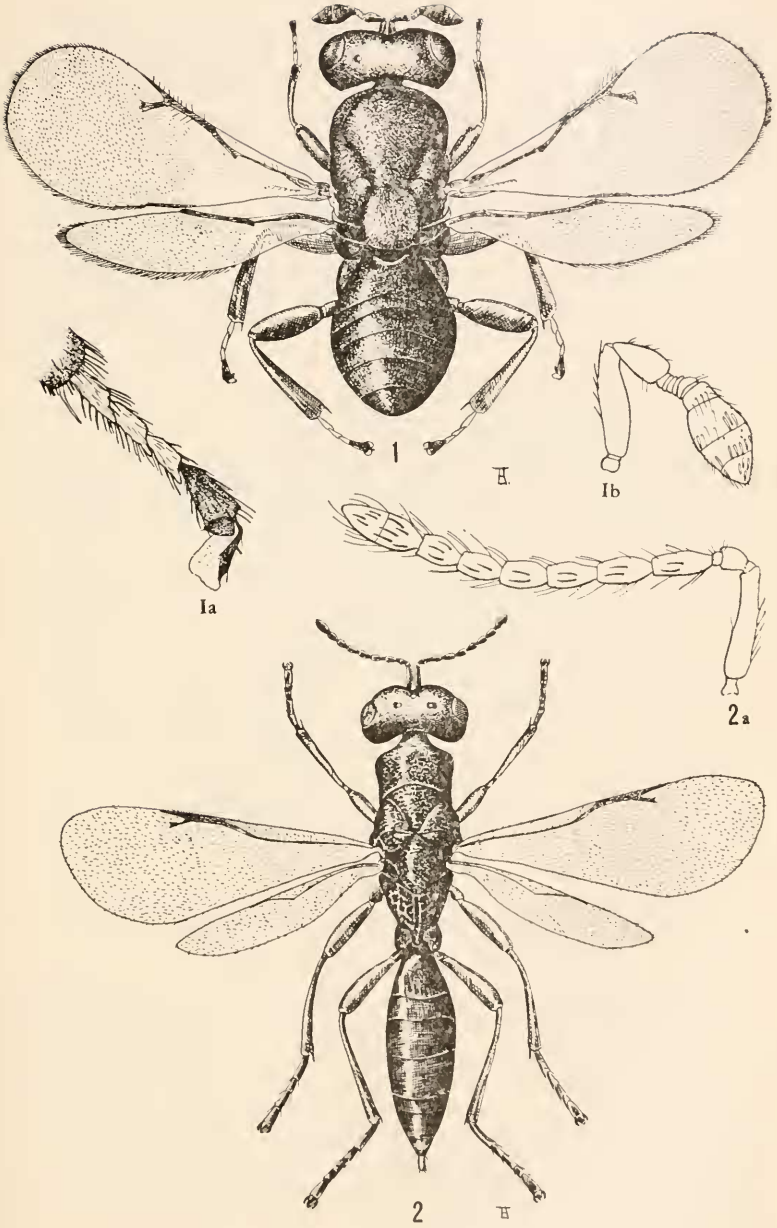
cone-shaped and somewhat longer than broad at apex; ring-joint small; funicle distinctly 6-jointed, the first funicle joint about twice as long as the pedicel, following joints shorter but each distinctly longer than broad; club scarcely thicker than the funicle joints, about as long as the two preceding funicle joints combined, 2-jointed, the joints subequal; pronotum large, the dorsal portion behind the anterior declivity as long or nearly as long as the mesoscutum, narrowest at the posterior margin, coarsely rugoso-punctate anteriorly, more finely reticulate-punctate posteriorly; mesoscutum and scutellum nearly uniformly rugoso-punctate, some of the punctures more or less rounded and indistinctly umbilicate; propodeum coarsely rugose with a narrow moderately deep, immargined median longitudinal channel, the sculpture within this groove similar to that of remainder of propodeum; forewings reaching nearly to apex of abdomen; marginal vein thick, fully twice as long as the stigmal; postmarginal nearly twice as long as the stigmal, indistinct toward apex; hind coxae reticulate-punctate; abdomen as long as the head and thorax, subcylindrical, slightly compressed, distinctly petiolate; abdominal petiole usually a little broader than long (in one specimen as long as broad), rugosely sculptured; tergites beyond the petiole (except the first which is polished) faintly shagreened; first tergite constituting approximately one-fourth the total length of abdomen; second about one-third as long as first; third and fourth subequal and a little less than twice as long as second; fifth and sixth longer than the second and not as long as the third; ovipositor sheaths slightly exposed at tip. Black; antennal scape, pedicel, all tarsi, anterior tibiae, apices of all femora, and the middle and hind tibiae at base and apex testaceous; all femora except apically, and the middle and hind tibiae except base and apex black or brownish-black; wings hyaline, the venation brownish. Male unknown.

Full grown larva.—Length 7.5 to 9 mm.; width at second segment approximately 1.2 mm. Long, slender, cylindrical, tapering slightly from the second segment to a blunt point posteriorly; on the median line of the dorsal surface are eight more or less prominent, bluntly cone-shaped protuberances each arising at the junction between the segments, the first between the third and fourth segments and the eighth between the tenth and eleventh segments, the first and last usually much smaller than the other six; occasionally a similar process indicated between the eleventh and twelfth segments but this never prominent; spiracles very small and circular; mandibles curved, acute at apex, with or without a distinct tooth on the inner margins some distance from the apex. Color pale yellowish white with the mandibles dark brown. Described from specimens in alcohol.

The larvae live within the young stems and the adults emerge in the spring through small round shothole-like apertures cut in the flattened side of the previous year's growth.

Mr. Sasscer has supplied the following notes:

"A number of dead shoots of *Phyllotachys* which were undoubtedly killed by the jointworms were found in the gardens. Adults were found in living as well as dead branches. Exit holes are most frequently found in dead branches, although some branches which were alive exhibited adults ready to emerge,


1
H.
Ia
Ib
2a
2
H

larvae, and pupae. On April 19th, fully 85 per cent of the overwintering larval stage had pupated and were emerging as adults. In all probability there is but one generation a year, the adult appearing in early spring and depositing eggs in the young shoots in which the larvae develop until late fall and overwinter as full grown larvae.

"From present indications, it would appear that this joint-worm is a comparatively recent introduction into the Brooksville gardens, or else it has been there for some time and is slowly developing into a serious pest. It is recalled that in January, 1917, an inspector of the Florida Plant Board reported the finding of a borer in bamboo from Avery Island. Unfortunately, this larva was not preserved." The following observation was made by Dr. B. T. Galloway: "The adult fly always pierces the node through the sheaf in such a position that the egg may develop just above the node where the larval and pupal stages take place."

Type locality.—Brooksville, Florida.
Type.—Cat. No. 24371, U. S. N. M.
Host Plant.—Phyllotachys bambusoides.

Described from five female specimens reared by E. R. Sasscer from young stems of bamboo, April 10, 1918, and three females reared by C. A. Bennett in April, 1919, from the same source.

Harmolita poaeola, new name.

Harmolita poae Phillips and Emery, Proc. U. S. Nat. Mus., vol. 55, 1919, p. 445 (not Schlechtendal 1891). See ante, p. 46.

EXPLANATION OF PLATE 7.

Figures prepared by Eleanor T. Armstrong under the writer's direction.

Figure 1. *Rhicnopeltella eucalpti* Gahan, adult female.
1a. " " " hind tarsus of female.
1b. " " " antenna of female.
Figure 2 *Harmolita phyllotachitis* Gahan, adult female.
2a. " " " antenna of female.

NEW TIPULIDAE FROM BRITISH COLUMBIA (DIPTERA).

By C. B. D. Garrett, *Cranbrook, B. C.*

The season of 1920 produced a large number of specimens many of which were new to the Kootenay List, however, I did not have the time this winter (1920–21) to work them further than to the genera, the following few notes being of more than passing interest were completed. On August 2, 1920, I was lucky enough to secure a perfect female of that very rare fly *Protoplasa vipo* O. S. I took it on the window of a pool room in the center of Cranbrook, B. C., doubtless attracted there by the light of the previous evening. This I think is the first Canadian record of this genus.